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# Contribution of archaeozoology to the characterization of the mobility systems of the latest nomadic societies: a combined approach of classical archaeozoological methods, cementum increment analysis and three-dimensional dental microwear texture analysis

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## Résumé

The question of forms of mobility is central to understanding the lifestyles of prehistoric societies (economic behavior, subsistence strategies, cultural and social complexity or the intergroup relationships of hunter-gatherers, adaptation to their environment, etc) and contributes to the possibility of reaching a micro-regional scale of socio-economic systems. The characterization of these forms of mobility is most often based on the ethnographic models of L. R. Binford (1980), which oppose two theoretical extremes within the same continuum, the logistical mobility (i.e. collectors) and the residential mobility (i.e. foragers). Both models postulate that relocation dynamics are partly related to the distribution and seasonal and spatial accessibility of resources. Specific archaeological signatures are supposed to differentiate them and thus allow the identification of these rhythms of movements and the types of sites occupied. In prehistoric archaeology, territorial movements and their rhythms can be perceived through different remains providing data on the seasonal acquisition of certain resources. For wildlife, the occupation season of sites is inferred from the bone remains that provide information about the seasons of acquisition and slaughter of the hunted prey. The function and duration of occupation are established through a multidisciplinary approach combining archaeozoological data and other archaeological proxies.

For the Mesolithic in France, little work has addressed the issue of hunter-gatherer mobility. Based on this observation, my thesis project proposes to complete these works by developing a diachronic and micro-regional approach on the scale of the Quercy Causses and its margins. The high density of deposits, which are generally well documented, particularly through recent excavations, provides a reliable radiochronological framework. The environment is characterized by a strong geographical compartmentalization, which may have favored a compartmentalization of human groups undoubtedly accentuated over time by the densification of the forest cover leading to the installation of the large primary forest. The

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Quercy Causses are an excellent field of investigation to document the exploitation of the territories by the Mesolithic. The objective is then to develop one or more mobility models by following an inductive approach, on both a spatial and temporal scale of analysis. Considering the entire period opens up the possibility to question at a certain level the causes of changes if they are proven. Parameters related to the environment and culture could therefore be tested including: Did the gradual increase in forest cover influence forms of mobility? Are these changes synchronous with the changes recorded in material cultures, especially during the passage between the Early and Late Mesolithic periods? Finally, an extra-regional comparison based on the same methods, questioning the possible forms of mobility, will be carried out from three sites along the Breton coastline. This comparison will only be applied for the Late Mesolithic and will question the relationship between human groups and their environment as well as the seasonal complementarity of land and marine resources, which are abundant throughout the year.

Three complementary archaeozoology methods will be applied including: classical archaeozoology methods, cementochronology analysis and dental microwear analysis. The first method considers all bone and dental remains. It allows us to question the origin of the accumulation of remains, hunting strategies and the exploitation of carcasses. In addition, it provides data on the seasonality and duration of sites occupation, particularly from dental remains. Seasonal information from eruption dates and degree of occlusal wear surfaces of the teeth is accurate for the youngest cervids due to a single, short birthing time during the year. However, for adult cervids, aurochs and wild boar, this method is not efficient because 1) it implies invariance in time and space of the eruption and wear processes of the teeth; 2) it is not precise enough for adult individuals; 3) aurochs is an extinct species; 4) the spread of births over the year and the possibility of two annual litters for wild boar makes its use irrelevant. Therefore, it seems appropriate to view the question of season of hunting through the prism of dental cementum analysis. This method is based on the study of microscopic marks of seasonal and regular growth included in the thickness of the acellular cementum covering the first third of the dental roots. Correlated to seasonal variations, they appear as two distinct alternating bands: a fast growth deposit called "Zone" referring to the time of year from mid-spring to autumn and a slow growth deposit called "Annulus" referring to wintertime. The identification of the nature of the last deposit and the evaluation of its relative thickness compared to other bands of the same nature allows the estimation of the animal's death season. Moreover, this method is also effective in specifying animal acquisition strategies since it specifies the slaughter ages of the prey. Since a pair of bands (a zone and an annulus) represents a year, counting the pairs of bands plus the age of root formation makes it possible to assign an age to the death of the animal. These cementochronology studies will be supplemented by the three-dimensional dental microwear texture analysis (3D-DMTA) to answer the question of duration of sites occupation. This method aims to quantify the microscopic wear characteristics observed on enamel wear facets on occlusal surfaces of teeth. The microscopic features result from a combination of attrition (tooth to tooth contacts), abrasion (tooth to food contacts, including exogenous particles that stick to food) and erosion (from acidic food). Microwear surfaces therefore reflect the mechanical properties of ingested foods as well as chewing dynamics and tooth morphology (on the microscopic and macroscopic scales). Their recording is continuous and renewed at each "feeding event" leading to the observation of the "Last Supper" since the exogenous and endogenous abrasive particles of the chewed elements continuously erase the old microtraces of the previous meal. The information about the diet and local and seasonal environmental conditions of the last days (or weeks) of the animal's life is therefore available. Its application in archaeology has been tested by studies, particularly in the search for the duration of site occupation, considering that a significant variation in dental microwear signals can signify long or repeated occupation at different periods of the year. On the other hand, a small variation seems to define short and/or seasonal occupation. Finally, due to frequent turnover of dental microwear and as most animals show significant seasonal variations in their diet, the season of death of the animal may be recorded. Therefore, this method has great potential for reconstructing the season of site occupation.

These three methods will be applied in Quercy on all the reliable sites that have yielded faunal remains, a total of 6 deposits representing 32 stratigraphic levels covering the entire

Mesolithic sequence. Also in Brittany, where 3 sites attributed to the Late Mesolithic will be summoned.

**Mots-Clés:** Archaeozoology methods, Cementochronology analysis, Three dimensional dental microwear texture analysis, Mesolithic, Quercy, Brittany